

sPHENIX HCal Simulation Status Overview

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Minutes from May 1st Simulation Meeting

1. Next generation simulation production:

- **Action Item [Chris]:** set simulation production in new sPHENIX software environment
- **Action Item [Jin]:** Implement Birks Law and more realistic Magnetic Field structure in absorber and scintillator for Hcal
- **Action Item [Chris]:** Submit production for:

1) different tilt angle as in Liang's slides,

2) pi+ and pi- single particle simulation

3) jet simulation based on pythia jets.

QGSP_BERT_HP physics list will be used in this production.

Absorber energy will also be saved, so the pion production can also be used to calibrate sampling fraction.

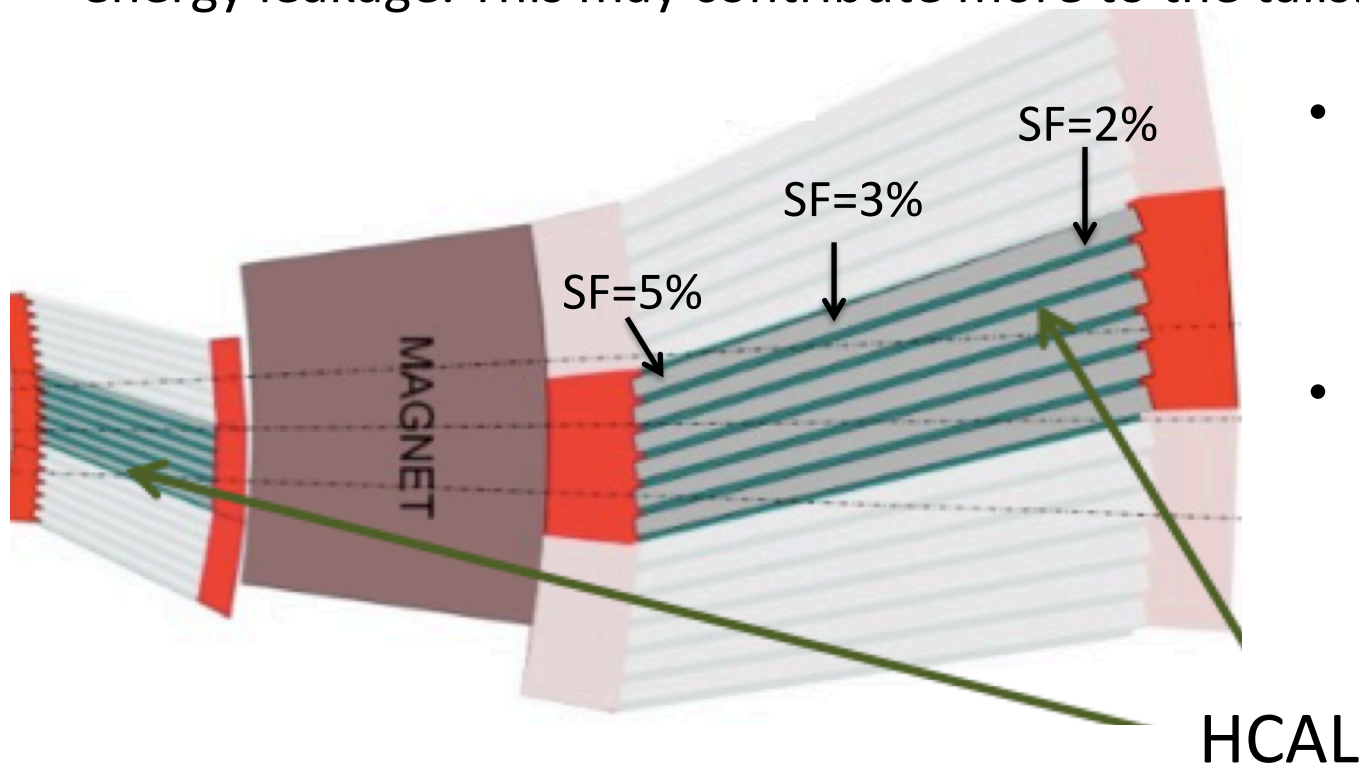
2. **Action Item [Liang]** will analyze the new production data, also with suggested study as in the above action item.

Actual Suggested Study

- What we learn from our first tilted angle scan (2 k events):
 - Mean SF(muon) vs. tilted angle is uniform, less SF(muon) fluctuation for larger tilted angle
 - Energy resolution slightly improved vs. increased tilted angle
- What we suggested for future study:
 - Quantify both high and low side tail of energy spectra for energy leakage/channeling vs. tilted angle for hadrons
 - Quantify jet performance in term of energy resolution and leakage
 - GEANT4 simulation data production:
 - G4 data for both jets and single particles with 10 k events
 - Detector configuration: Inner HCal 32; Outer HCal 0, 4, 8, 12, 16
 - Detector configuration: Outer HCal 12; Inner HCal 0, 8, 16, 24, 32;
 - Reference: Inner HCal 0, Outer HCal 0

Lower / Higher Side Energy Spectra Tail

- Lower side may due to particle punch-through / channeling
- SF decreases along radius, average SF is $\sim 3\%$. hadronic showers develops early in outer HCal could be **over estimated**, and that develops at the far end could be **under estimated** (Edward).
- Shallow shower has less energy leakage, while deep shower has more energy leakage. This may contribute more to the tails.



- Study energy spectra shape with shower CG cut.
- Correlating low / high side tail with energy deposited in black hole at the back of HCal

Next HCal Prototype Simulation

- According John, we are aiming for a beam test in April 2016, and detectors need to be ready for testing at BNL in Jan 2016.
- As long as we have the fixed design of next HCal prototype, we will start to do related simulation study.